

## **REMARKS**

### **Amendment To The Specification**

On July 21, 2003, The Examiner issued a verbal restriction requirement between the claims of Group I, including claims 1-13, 34-54, 65 drawn to a sensing element for use in a light diffraction assay, claims of Group II, including claims 14-33 drawn to a diffraction binding method for detecting at least two analytes in a medium simultaneously, claims of Group III including claims 55-64 drawn to a method of producing a sensing element for use in a light diffraction assay.

In response to the Restriction Requirement, the Applicants hereby elect the claims of Group II including claims 14-33 for continued prosecution on the merits. This election is being made without traverse subject to Applicants right to seek individual application with respect to the non-elected claims. Claims 1-13, and 34-65 are hereby cancelled.

The amendments made herein are in response to the Examiner's Report dated 08/04/2003 and the interview held on November 20, 2003 between Examiners Nelson Yang, Long Le, the applicant Cynthia Goh and the agents of record, Ralph Dowell and Lynn Schumacher. The applicant and agents of record thank Examiners Yang and Le for taking the time to see them and their suggestions regarding the claims.

The Summary of Invention starting on page 5, line 17 has been amended on to make it commensurate with the amendments to independent claim 14. The Detailed Description of the Invention has been amended on page 8, line 15 to replace the word "image" with the word "pattern" to make it commensurate with the rest of the disclosure, such as for example page 14, lines 7 to 11.

The claims have been amended to more clearly and succinctly claim the present invention. Specifically, the preamble of claim 14 has been amended to

replace the phrase "A diffraction binding assay method for detecting simultaneously at least two analytes in a medium, comprising:" by the phrase "*A method for detecting simultaneously at least two analytes in a medium using light diffraction, comprising:*" This amendment is to avoid any ambiguity in respect of the term "diffraction" which may have a chemical connotation. The amended preamble makes it unambiguously clear the method uses diffraction of light.

The term "pre-selected" has been inserted before the phrases which recite the first and at least second analyte-specific receptor patterns in addition to being inserted before the term "diffraction patterns" since the patterns of analyte receptors are clearly selected to give unique or pre-selected diffraction patterns, as disclosed on page 8, line 12 to 23, and on page 16, lines 26 to 27.

Similarly, lines 6-8 of claim 1 have been amended to recite "wherein each pre-selected pattern gives rise to a pre-selected diffraction pattern distinct from all the other diffraction patterns". This again is consistent with the same passages in the disclosure referred to above.

The phrase "solution" in line 10 has been replaced by the word "*medium*" to be consistent with the preamble.

Lines 12 to 13 have been amended to add the limitation "illuminating the substrate and detecting, at a position spaced from the substrate surface, an image of diffracted light from the substrate surface". This feature is shown in for example Figures 2a, 2b and 2c where the detector 34 is positioned away from the surface of the substrates so that clearly the image of diffracted light is detected at a position spaced from the substrate surface. This is also disclosed on page 13, lines 27 to 31. This portion of claim 14 has also been amended to be consistent with the disclosure, (page 14, lines 7 to 11 and page 16, lines 28 to 31) wherein it is disclosed that an image of diffracted light from the surface is

detected and then analyzed or deconvoluted into the constituent diffraction patterns which make up the image.

Claim 14 has been amended in lines 14 to 18 to recite: “analysing the image of diffracted light for presence of one or more of the pre-selected diffraction patterns representative of binding of one or more analytes to their associated pre-selected pattern of analyte-specific receptors and identifying from the image of diffracted light one or more analytes present in the medium.” This amendment is so claim 14 is consistent with the description on page 14, lines 7 to 11, and page 16, lines 28 to page 17, line 1.

The Examiner has objected to claim 15 on the basis the phrase “a part of each of said at least two patterns” is not written in a clear manner. The Examiner noted the claim as drafted could be interpreted in one of two ways, and Applicants note the intention was to claim the second interpretation, namely it should be interpreted as illumination of part of all the patterns on the substrate, of which there are at least two. Nevertheless, claim 15 has been amended to more clearly claim the present invention by reciting “illuminate at least a part of each pattern present on the substrate.”. In view of this amendment Applicants respectfully submit it is clear that the second interpretation is correct, see page 10, lines 15 to 17.

Claims 17, 18 and 19 have been amended to be commensurate with the amendments made to claim 14.

Claim 20 has been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite, on the basis that the phrase “said light source” in line 1 of the claim lacks antecedent basis. Responsively, claim 20 has been amended to more clearly and succinctly recite the present invention.

New claim 66 has been added to claim the specific embodiment of the method in which the step of analyzing the image of diffracted light includes

analyzing for differences in intensity arising after exposing the patterned substrate to the medium compared to the intensity measured before exposing the substrate to the medium, as disclosed on page 9, lines 19 to 21.

### **Patentability of the Claims Over the Cited References**

Claims 14-33 have been rejected under 35 U.S.C. § 102(e) as being anticipated by the reference United States Patent No. 6,586,193 ('193) issued to Yguerabide et al. Reconsideration of the grounds for rejection under 35 U.S.C. § 102(e) is respectfully solicited for the following reasons.

The '193 reference has been cited for the proposition that it discloses the subject matter of independent claim 14 in its entirety. Applicants strongly disagree with this assertion. Specifically, '193 is directed to a method of detecting one or more analytes in a sample with scattered light which is observed using the human eye (see Abstract), claim 1(c) and in the disclosure in numerous places, see for example column 9, lines 57 to line 5 in column 10. This passage clearly states that light scattering using particles with sizes less than the wavelength of light is the operative effect and this is referred to as DLASLPD (direct light angled for scattered light only from particle detected). This is further supported elsewhere, for example the method enables detection by the human eye by attachment of a "detectable light scattering particle to the target analyte ..." as disclosed in for example column 99, lines 6 to 8. As succinctly summarized and recited in claim 1(a) of '193, the method relies upon:

"providing a plurality of distinct populations of scattered light detectable particles of a size between 1 and 500 nm inclusive, wherein each population specifically binds to different predetermined analyte, and has a particle type configuration distinguishable from other populations by its predetermined scattered light detectable property;"

In contrast, the present invention as embodied in claim 14 relies upon a totally different method for determining the presence of multiple analytes. Claim 14 recites:

*"providing a substrate including a surface and on the surface a first pre-selected pattern of a first analyte-specific receptor and at least a second pre-selected pattern of a second analyte-specific receptor, wherein each pre-selected pattern gives rise to a pre-selected diffraction pattern distinct from all other diffraction patterns;"*

Applicants submit this is a completely different method from '193 as discussed above in that the present method uses patterns formed on the substrate which have their own distinct diffraction pattern which clearly emerge as analyte species bind to their analyte specific receptor. The Examiner is directed to column 71, lines 21 to 24 where '193 clearly discloses:

"In most forms of the present invention the light scattering signals from the **light scattering particles are detected from particles that are suspended in solution** or from particles that are associated with a solid phase."

In other words, the method disclosed in '193 does not rely on detection of diffraction patterns caused by diffraction of light from species bound to their analyte specific receptors but rather '193 **involves light scattering from suspended particles**.

It is noted that in the present invention it is the diffraction image, or part thereof, that is detected, **NOT** an image of the surface *per se*. This is clearly disclosed in several places in the description wherein it is disclosed that the "diffraction image" is detected and then deconvoluted into the constituent diffraction patterns. The Examiner's attention is directed to page 9, lines 15 to 21, page 14, lines 7 to 11, and page 16, lines 28 to page 17, line 1. In contrast, what is observed in '193 is the particles lighting up when analyte species bind to those

particles, so essentially what is observed is the pattern of particles being illuminated by light scattering, which is quite different from the present invention.

The Examiner has referred to the passage in '193 in column 26, lines 23-35 in which Yguerabide teaches that spherical particles of a certain size can also behave as a diffraction grating. Applicants respectfully point out this effect is based on scattering of white light from large microparticles suspended in solution, and is not related in any way to the subject matter of claim 1 in which the diffraction image arises due to light diffracting from analyte species bound to receptors formed in patterns on the surface of the substrate.

With respect to the disclosure in column 94, lines 15 to 54 under the heading Microarray or Micropattern Assays with Light Scattering Particles referred to by the Examiner, it is noted that once again the '193 depends upon light scattering from the particles rather than diffraction of a light beam.

Applicants note that there is a difference between the concepts of "light scattering" from individual particles (or microspots) in '193 and "diffraction of light" as claimed in claim 14 of the present application and disclosed in the description. This significant distinction between '193 and the present invention is most succinctly captured on page 9, lines 15 to 17 of the present invention where Applicants disclose:

**"Since the recognition elements are present on the substrate in a pre-determined pattern, light incident on the substrate will not be scattered uniformly, but rather will be diffracted."**

In Applicants' case, when one uses a clear pattern of obstacles (the patterns of analyte-specific receptors), what is being observed in the method is a diffraction pattern, which is a pattern of the interference of light diffracted from the receptors making up the pattern. In the case of '193 the "patterns" refer to microarrays or microspots (ie, microarray elements in some kind of pattern.). The

distinction is that in the case of '193, each microspot contains a different material, and they measure the light scattering signal from each microspot as corresponding to one analyte. In Applicants' case, the diffraction image for one analyte is generated from the set of elements that make up one pattern, such that the elements all have the same material. See for example column 94, line 40, where '193 teaches "The number of light scattering particles attached to each microspot is then a measure of the amount of analyte present in each microspot..." or lines 59-60, which says that signal from each area has to be separated by imaging. This is quite different from Applicants method since they do not look at each line/spot/element of a diffraction pattern.

In view of these quite distinct differences, Applicants respectfully submit the subject matter of claims 14 to 33 are not disclosed in '193 and certainly those of ordinary skill in the art upon reading '193 would not be led to the subject matter of these claims.

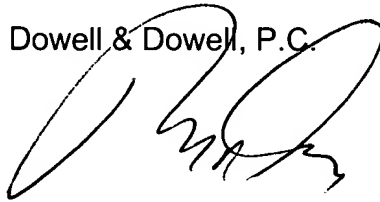
In view of the foregoing, reconsideration and withdrawal of the rejection of claims 14-33 is respectfully solicited and favorable consideration and allowance of claims 14-33 and 66 is requested.

Should the Examiner have any questions regarding the allowability of the claims with respect to the art, it would be appreciated if the Examiner would contact the undersigned attorney-of-record at the telephone number shown below for further expediting the prosecution of the application.

Respectfully submitted,

Dowell & Dowell, P.C.

By:

A handwritten signature in black ink, appearing to be 'R. A. Dowell', written over a horizontal line.

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